Laboratory Examinations, Methods, and Procedures

Version: 12/15/2019	Document Number: FSS-6001	Distribution: FSS

Policy Statement / Objective:

This policy provides a list of examinations, methods, and procedures provided by the MN BCA FSS for customers and personnel.

Policy:

I. Biology

The Biology section conducts several types of serological examinations on evidentiary materials, including the indication of blood, seminal fluid, saliva, and urine and the identification of semen. Serological examinations may consist of color tests (blood, semen, saliva and urine), immunological tests (blood and semen) or microscopic examinations (semen). Additionally, biological material such as hair, tissue and skin cells may be collected from evidence.

Nuclear autosomal and Y-chromosome short tandem repeats (STR) DNA testing using capillary electrophoresis is performed to determine possible sources of biological samples. This involves comparing the DNA types obtained from the questioned stains with the DNA types obtained from known blood and/or saliva samples from victims and suspects. Bloodstain pattern analysis at crime scenes and on a variety of items collected from crime scenes (e.g. clothing, weapons, etc.) can also be requested.

STR DNA profiling is performed on convicted offender samples submitted by law enforcement agencies, correctional facilities, and probation/parole agencies, as mandated by Minnesota legislation. DNA profiles are imported into the State DNA Index System (SDIS) database, and searched against DNA profiles obtained in criminal and missing persons cases. Convicted offender DNA profiles are also uploaded to the National DNA Index System (NDIS) database for searching against DNA profiles uploaded by other states. SDIS and NDIS are two components of the Combined DNA Index System (CODIS). Searches are also performed to compare casework DNA profiles with other casework profiles.

Mitochondrial DNA (mtDNA) analysis is performed on evidentiary materials that are typically unsuitable for nuclear DNA analysis. These materials include hair, teeth, and bone. The extraction of mtDNA is followed by amplification of the control region (HV1 and HV2) using the polymerase chain reaction (PCR). The amplified mtDNA is then quantified and sequenced using capillary electrophoresis technique. The mtDNA types obtained from evidentiary materials are then compared to the mtDNA types obtained from known blood and/or saliva samples from victims and suspects.

STR DNA profiling and mtDNA analysis are also conducted on samples for entry into the National Missing Persons DNA Database. These samples include those collected from unidentified human remains and known samples collected from relatives of missing persons.

II. Bloodstain Pattern Analysis

The Bloodstain Pattern analysts assist in the reconstruction of events of an alleged incident that could have created the stains and stain patterns present at a crime scene, as well as on items of physical evidence (e.g. clothing, potential weapons) either recovered from or related to that scene. In some cases, it may be necessary to conduct a bloodstain pattern interpretation using photographic images. The usefulness of individual bloodstains and bloodstain patterns lies in their retention of information descriptive of the possible events that could have produced them. The sizes

of the individual stains, the shapes and appearances of these stains, and their distribution relative to one another within the scene and on an item can be utilized for the purposes of determining how a particular stain or stain pattern may have been produced.

III. Breath Alcohol Calibration

The Breath Alcohol Calibration Laboratory trains law enforcement personnel in breath alcohol testing procedures, evaluates, maintains, calibrates and annually certifies evidential breath alcohol testing instruments. Expert testimony for Implied Consent and DWI cases is provided along with specialized training in the area of breath testing to judges and attorneys. The current instrument utilizes infrared technology with an optional electrochemical fuel cell.

IV. Chemistry

The Chemistry section is responsible for the analysis and identification of suspected controlled substances. This includes clandestinely manufactured products as well as legitimately manufactured pharmaceutical products. Controlled substances found in various psychoactive plant materials are also identified. Identifications are made utilizing gas chromatography/mass spectrometry (GC/MS) and/or Fourier Transform Infrared Spectrophotometer (FTIR) instrumentation with the exception of marijuana, which is typically identified by a combination of color tests and microscopic examinations.

The Fire Debris section conducts analysis of fire debris samples via gas chromatography/mass spectrometry (GC/MS) for the presence of ignitable liquids that may have been used to start or accelerate a fire. The examinations performed are based on applicable ASTM International guidelines for sample extraction, preparation and analysis.

V. Crime Scene

The Laboratory's Crime Scene Teams provide on-site crime scene processing services to Minnesota law enforcement agencies, when requested. The Crime Scene Team will respond for assistance in cases were there has been a violent crime against a person and that person is not able to immediately or effectively aid investigators in the investigation. Typically, the Laboratory Crime Scene Team will respond to:

- Homicides
- Attempted Homicides
- Abductions
- Death Investigations
- Officer Involved Shootings
- Clandestine Grave Body Recoveries

The Crime Scene Team will not typically respond to:

- Burglaries
- Criminal Sexual Assaults
- Assaults

The Crime Scene Team will process vehicles that are brought to the Laboratory Garage by a law enforcement agency. Standard crime scene response criteria do not need to be met and can include any felony offense.

During crime scene processing, the team may search for various kinds of forensic evidence including but not limited to biological (e.g. blood and semen), latent print, trace (e.g. hairs, fibers, glass, paint, fire debris, shoe print and tire track impressions), questioned document, toolmark, and firearms evidence. The Crime Scene Response Vehicle has all necessary supplies and equipment to collect, preserve and transport physical evidence gathered at crime scenes. In addition, the team may perform bloodstain pattern analysis and shooting scene reconstruction if the evidence supports such exams.

VI. Digital and Multimedia Evidence

The Digital and Multimedia Evidence section is responsible for the preservation and retrieval of digital evidence related to criminal cases. Items of digital evidence may include but are not limited to computers, cellular phones, tablets, cameras, hard drives, flash drives, SD cards, digital discs, digital video recorders, gaming systems, etc.

The Digital and Multimedia Evidence section utilizes forensic methods and tools to extract and parse the retrieved data into a utilitarian format to assist agencies with the examination of their evidence.

VII. Firearms and Toolmarks

The Firearms and Toolmarks section conducts many types of firearms examinations: whether a questioned bullet or cartridge case was fired from a suspect firearm; the caliber and type of firearm possibly used to produce fired bullets and cartridge cases when no firearm has yet been recovered; the proximity of the firearm to the target material (with a visual examination and using chemical tests for copper, lead and nitrites); whether a firearm is functional; and whether submitted ammunition is a commercial load or reload. The section has access to a National Integrated Ballistic Information Network (NIBIN) database which links firearms evidence from different crime scenes.

In addition, the section works with toolmarks to determine whether an evidentiary toolmark is made by a recovered tool and/or the type of tool that may have been used to produce a toolmark. Serial number restorations on various item types are also performed using chemical reagents or ultrasonication to etch the base material.

VIII. Latent Prints

The Latent Prints section compares unknown friction ridge impressions with known exemplars and renders a conclusion of identification, exclusion, or inconclusive. The process is a quantitative and qualitative examination of the ridge detail present and is known as the ACE-V method. ACE-V is an acronym for analysis, comparison, evaluation and verification. The section utilizes an Automated Fingerprint Identification System (AFIS) to search unidentified friction ridge impressions in the database of the Midwest Automated Fingerprint Identification Network (MAFIN).

The section also analyzes adhesive, porous, non-porous, semi-porous, and blood-contaminated evidence for the presence of friction ridge impressions. This is done with the application of powders, dye stains, cyanoacrylate fumes, chemicals and blood enhancing reagents. Examinations are made utilizing lasers, alternate light sources, photography and digital imaging.

IX. Toxicology

The Toxicology section analyzes blood, urine, and other biological samples for the presence and concentration of alcohol and other volatiles utilizing gas chromatography (GC) technologies. These biological samples can also be screened for drugs of abuse (barbiturates, phenytoin, benzodiazepines, opiates, GHB, THC, cocaine, phenethylamines, phencyclidine, propoxyphene, norpropoxyphene, methadone, carisoprodol and meprobamate) as well as less common substances including synthetic drugs. These drugs can then be confirmed and quantitated (as applicable) utilizing gas chromatography/mass spectrometry (GC/MS) and liquid chromatography/mass spectrometry (LC/MS/MS) technologies. A complete list of confirmatory analyses listed by matrix (blood/urine) can be found on the BCA Forensic Science Services website under the Toxicology section.

X. Trace Evidence

The Trace Evidence section makes comparisons to determine if there is a similarity between known and unknown samples of glass, paint, fibers, hair, tape, and other materials. Instrumentation that may be utilized in some or all of these examinations include Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscope/Energy Dispersive Spectrometry (SEM/EDS), Pyrolysis Gas Chromatography (PGC), Microspectrophotometry (MSP), Glass Refractive Index Measurement (GRIM3), and microscopic examinations. Other examinations include the pattern evidence such as shoeprints and tire tracks, textile damage, filament determination for "on"/"off" status as well as physical matches of broken or torn objects.

The section also analyzes "chemical unknowns": non-narcotic, non-biological materials of evidentiary value. Identification, characterization and/or comparison of these materials is accomplished by the examination of physical properties and/or using analytical instrumentation such as, but not limited to GC/MS, FTIR, and SEM/EDS.

XI. Evidence Intake and Processing

The Evidence Intake and Processing (EIP) Section ensures evidence submitted to the MN BCA FSS is properly received, recorded in the Laboratory Information Management System, and returned to the submitting agency once all forensic analysis has been completed. Relevant documents and reports for discovery pursuant to the MN Rules of Criminal Procedure are prepared. Additionally, physical evidence may be processed by collecting and preserving biological samples and trace materials from items utilizing standard laboratory methods and procedures to prepare evidence for analysis.

Revision History

Previous Version: AD-6305-01-E
Description of Changes:

- Updated to PowerDMS template
- Added BPA section
- Renamed from AD-6305-01 to FSS-6001

Document Approval

Initials and Date	*Title*
N/A	Technical Leader(s)
N/A	Supervisor(s)
MTL 12/10/2019 **KK 12/10/2019** **KLP 12/10/2019**	Quality Assurance Personnel
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Document Archival

Reason for Archival:

Initials and Date	*Title*
	Quality Assurance Personnel